CHAPTER 2

Origins and Applications of Revenue Management

History of Revenue Management

American Airlines is credited with introducing the practice of revenue management—then known as yield management—in 1985.[1] The first major low-fare airlines, most notably People Express, appeared on the scene, posing a major revenue threat to the established carriers. Matching the low fares across the board was not considered an option because the revenue loss would be too great. American sought ways to target fare reductions to customers, times, and flights in a way that would most heavily impact its new competitors, while maintaining its normal price structure in other circumstances. Customers welcomed the price competition. Many flyers were wary of the new airlines; they appreciated the lower prices but did not particularly want to fly on the unproven airlines. Thus, the targeted price reductions by American tended to keep customers flying American. American's strategy proved successful, since People Express and other new low-fare airlines of that era did not survive for long.

Even though the competitive threat was diminished, yield management survived as a technique because it was seen as a way to enhance revenues, filling what would otherwise be empty seats by offering carefully targeted price reductions. The technique spread to other airlines, and then to other industries with economic characteristics similar to those of airlines, such as hotels, restaurants, and golf courses. Over time, the *yield management* terminology evolved into *revenue management*; the latter terminology generally continues, though some authors now prefer the term *customer-centric pricing*.[2]

Initial Characteristics for Application of Revenue Management

The early literature in the field identified five characteristics that made an industry or firm a good candidate for utilizing revenue management techniques:[3]

- *Relatively fixed capacity*: The inability to easily change one's total capacity or its deployment in response to variations in demand. Airlines, for example, have a given number of aircraft and scheduled flights; hotels have a fixed number of rooms of various types; and restaurants have a given seating and service capacity. Modification of capacity usually cannot be done quickly and tends to be costly. This characteristic by itself is neither distinctive nor restrictive; virtually all organizations have a more or less fixed capacity. If capacity depends primarily on physical assets, short-term change is harder than the case in which capacity depends primarily on personnel. Professional service firms, for example, may be able to adjust capacity via overtime work or temporary staffing.
- *Perishable service capacity*: The ability to sell the services of capacity is short lived; unused capacity cannot be inventoried for future use. A flight departing with empty seats; a night's vacant rooms at a hotel; unfilled space at a restaurant, golf course, or movie theater; and rental cars remaining on the lot all represent permanently lost revenue opportunities. This characteristic generally applies to service industries; product industries usually have the opportunity to inventory unsold products for future sale. However, some physical products may be perishable as well; yesterday's newspaper or expired food products have little or no value.
- *High fixed costs and low variable costs*: Although this characteristic is not inherently necessary, it was common in the early applications of revenue management. If few costs vary with sales, then most of the added revenue from applying differential pricing or other revenue management techniques will fall

to the bottom line; the increase in profits will roughly equal the increase in revenues. Assuming such a cost structure was a characteristic of convenience, allowing revenue decisions to be made with little concern for the cost side, because incremental costs were minimal. Consider an airline flight; costs of the aircraft, crew, and ground support services will be unaffected by adding another passenger. There will be a slight increase in fuel usage and the cost of additional on-board refreshments, but little else. Selling a few more tickets at reduced prices will generally contribute to profits, at least in the short term. Minimal incremental costs also apply to renting additional hotel rooms or adding golfers to a course; somewhat higher incremental costs are likely to apply for restaurants and rental cars. But in all cases, costs could be largely ignored since most costs were fixed. Where this characteristic does not exist, revenue management still applies, but greater consideration must be given to the extent that increased revenues will be converted into increased profits.

- *Demand patterns that are uncertain or that vary with time*: If demand is constant across time, it is easier to match capacity with demand. But constant demand is not usually the case; demand varies according to time. An airline may find that its early morning and evening flights are fairly full with business travelers on one-day business trips, but its midday and perhaps its weekend flights are underutilized. Depending on its location, a hotel may have high occupancy during the week and lower occupancy on weekends. A restaurant may have excess dinner capacity before 6:00 p.m. These situations are a fertile ground for revenue management techniques to attract customers to underutilized times by appropriate pricing. Revenue management assumes that some customers are price sensitive and can be induced to shift their business to the underutilized times if the price is attractive.
- *Ability to forecast demand*: Companies that would use revenue management to bring additional customers to underutilized service times need the ability to forecast demand, to identify

> times when excess service capacity will likely exist. Also needed is the ability to decide which customers should receive lower price offers. The goal is to attract potentially new customers, not to convert existing customers who would otherwise pay full price.

Another characteristic of many early applications was the ability to sell in advance (airlines) or to have early indication of sales via reservations (hotels, restaurants, golf courses, car rental). This characteristic facilitates the ability to forecast demand.

Although these five conditions were common in the early applications of revenue management, they are not restrictive. Three of these conditions are fairly generic: relatively fixed capacity, uncertain or varying demand, and the ability to forecast demand are characteristics of most businesses. Two conditions are more restrictive: (a) a cost structure heavily weighted to fixed costs and (b) perishable *inventory*. These conditions are not inherently necessary, but they do make the analysis of the application easier. Added revenue approximates added profit if variable costs are minimal, and perishable capacity eliminates the consideration of inventory policy. As revenue management has grown in its applicability, companies lacking one or more of the previous conditions have entered the picture.

Managing Duration and Price of Service

In many of the early applications of revenue management, duration of the service was known or predictable. Air travel, cruises, and movies and other performances are of predictable length. For hotels, car rentals, and hospitals, the basic unit of service is known (a *day*), but the total length may not be. Thus, hotels routinely ask guests, upon check-in, to commit to a departure date, with a possible fee for early departure. Restaurants, golf courses, Internet cafes, and Internet service providers may have customers whose service duration varies. Some restaurant patrons may linger over their dinner and coffee, whereas others finish quickly and depart. Some golfers take longer than others to play the course, or play 9 holes rather than 18. Managing duration has its

limitations; golf courses may employ rangers who seek to maintain the flow of play, but restaurants have little control over the lingering customer. Unknown or unpredictable duration hinders the ability of the organization to maximize revenue. Fortunately, few service businesses have significant duration issues, and there is no issue of duration in product-based businesses.

In managing price, one question is whether the same price will apply to all customers at a given time, or whether different customers may be charged different prices. Restaurants, golf courses, and movies and other performances are generally fixed-price businesses, although they may use differential pricing to attract customers to underutilized times. Thus, restaurants will offer happy hours and early-bird specials, matinee prices for movies and shows will be less than evening prices, and golf courses may offer reduced rates for certain days or hours. On the other hand, airlines, cruises, hotels, and, to a lesser extent, rental cars may have concurrent customers who have paid very different prices.

Customer Reaction to Differential Pricing

Differential pricing has the potential to cause customer dissatisfaction. In most cases, differential prices are presented as *discounts* rather than *premiums* or *surcharges*, because the former is deemed to have much greater acceptability among customers. Some rationale for a price differential is commonly employed, such as an early purchase (airlines), a last-minute purchase (cruises, shows), fewer benefits (nonrefundable airline tickets), or less popular times (early dinner hour, matinee shows). In a product environment, discount coupons and discounts for excess inventories, discontinued products, end-of-season goods, or postseason goods are common. Customer reaction is discussed more fully in Chapter 6.

Early Applications of Revenue Management

The earliest applications of revenue management tended to be in industries that met the five characteristics discussed earlier: relatively fixed capacity, perishable service capacity, high fixed costs, uncertain or time-variable demand, and ability to forecast.

Airlines

As noted earlier, the airlines were the earliest reported application. American Airlines initiated yield management to respond to a new competitive threat. It targeted its price reductions on routes and times serviced by its low-fare competitors, with the intent of discouraging customers from shifting. The strategy was successful, and the new entrants did not survive.

After the competitive threat was gone, American Airlines and others continued to use differential pricing, seeing it as a way to build revenue by attracting new, price-sensitive customers. Leisure travelers were the primary target, since leisure travel was deemed far more discretionary than business travel. In an attempt to discourage business travelers from utilizing reduced fares, various conditions were imposed that were perceived as negative to the business traveler. Advance-purchase requirements, as long as 21 days, were imposed, on the grounds that most business travelers did not plan their trips far in advance. Saturday-night stay-overs were another common requirement, again with the thought that business travelers would wish to return home for the weekend. These served as *rate fences*: attempts to attract the discretionary leisure passenger and to exclude the nondiscretionary business traveler. Gradually, however, competitive forces tended to erode these restrictions.

Hotels

Hotels were also early adopters of revenue management. Hotels have many of the same characteristics as airlines: a fixed capacity, perishable service capacity, high fixed costs relative to variable costs, demand patterns that vary with time, and some ability to forecast demand. Like airlines, large hotel chains had reservation systems that could adjust price quotes based on expected occupancy and closeness to the date of service.

Restaurants

Restaurants also have many of the basic characteristics that are conducive to revenue management, as just enumerated for hotels. Unlike airlines and hotels, the service duration in a restaurant is variable; some customers

may finish quickly, whereas others linger. The restaurant has relatively little control over duration, although the pace of service may be a factor. If a restaurant accepts reservations, it needs to estimate how often tables will turn over and how to configure the availability of tables of differing sizes.[4] Making sure some tables are set aside for walk-ins, especially good customers, and considerations of overbooking also enter into the reservation planning.[5] Many restaurants use revenue management techniques to shift demand to slower times (early-bird specials, weekday discounts or specials, and late-night menu). If food preparation capacity allows, restaurants may also institute take-out service to expand revenue generation beyond its seating capacity.

Cruise Ships

The cruise ship industry also reflects the initial characteristics for adoption of revenue management. It is subject to many of the same features as airlines and hotels, because service duration is fixed. However, cruise lines typically charge by the person, not by the room (cabin), and have a much greater variety of cabin types than hotels have room types. Cruise lines also commonly sell trip extensions (pre- or post-cruise stays, usually at a port location) and airfare between the customer's home location and the embarkation and disembarkation points.[6] Since airfare may account for 20 percent or more of the total cruise price, one study suggests that attention to negotiating contracts with airlines and selecting the most cost-effective flights may reduce this cost to the cruise line by 5 to 8 percent.[7] In this context, the cruise line needs to be cognizant of revenue management both in its own price setting and in its purchase of airline services.

Cruise ships usually offer discounts on last-minute bookings, to fill otherwise empty space. Airlines, on the other hand, often charge full fare (or higher) to last-minute customers. Why the difference? Airlines' last-minute customers usually have a need to get somewhere on short notice, whereas no one *needs* to take a cruise, a purely leisure activity. Hotels' practices for last-minute customers are likely to vary, depending on an assessment of the customer's alternatives. If there is high demand in the area at the time, discounts are unlikely.

Golf Courses

Golf courses are perhaps most similar to restaurants, in that capacity is often measured as tee times, which depend on the number of players in a group and the pace of play, similar to the number of people at a table and the duration in a restaurant. Several uncontrollable factors exist, especially weather, as well as the number of daylight hours. Thus, most revenue management applications for golf courses focus on the scheduling of tee times.[8] Opportunities for demand-based pricing exist, usually based on time of day or season.

Later Applications of Revenue Management

Early applications of revenue management were centered in service industries featuring perishable capacity, with a predominantly fixed-cost structure. When variable costs are relatively very low, emphasis can be placed on maximizing revenue. Most businesses, however, have more than trivial variable costs. Here the emphasis will shift to maximizing gross margin, or revenue minus variable costs.

Air Cargo

Although air cargo might seem to be a simple extension of passenger airline applications, the situation is considerably more complex. Passenger airlines measure capacity as available seats, but air cargo carriers have to consider weight and volume and possibly product perishability. Passengers are generally time sensitive, wishing to reach their destination with minimal delays; freight shipments may be more time flexible. And although passengers generally represent individual purchases, cargo may involve contracts with shippers for guaranteed space. Cargo demand may also be less predictable than passenger demand. Cargo may be carried on passenger flights as well as freight-only flights. Thus, extending revenue management concepts to air cargo involves a number of additional considerations beyond passenger business.[9] Flight-by-flight pricing is less of a factor than longer-term pricing; and routing alternatives may play a greater role.[10]

Concerts and Entertainment Events

One-time events, such as an appearance by a performer, present different challenges for revenue management. Capacity is fixed, and demand cannot be shifted to times of excess capacity, since there is often a single performance. Pricing thus becomes especially important. Setting prices too high runs the risk that the event may not sell out, and opportunities for subsequent price adjustments are few. Setting the price too low leaves *money on the table*, as exemplified by resale of tickets in secondary markets.[11]

Retail

Bain describes the application of revenue management techniques by Tesco, a major British supermarket chain.[12] In retail, the critical dimension of capacity is shelf space; amounts of shelf space and prime locations will be assigned to products producing the greatest total gross margin. And just as airlines, hotels, and other service providers depend on masses of historical data to set their prices, supermarkets also use sales data, including those generated by customer loyalty cards, to make display location decisions.

Pricing decisions are certainly important in retail. Supermarkets and other retailers make extensive use of weekly specials, sales, discounts, coupons, buy-one get-one-free promotions, and the like, in part to entice customers to the store in the first place, and in part to increase the volume of customer purchases.[13] Loyalty cards play a role here as well, since advertised prices are often made available only to cardholders.

The airline or hotel customer usually seeks a single product—a flight or accommodation. The supermarket customer buys a quantity—often a considerable quantity—of products. Some purchases are preplanned, whereas others are made on impulse. Merchandising is far more important in retail, to encourage the purchase of more, and higher-margin, items. Thus, store layout, shelf-space decisions, attractive displays, product linkages (displaying bananas in the cereal aisle), and other revenue management techniques are designed to increase the store's net revenue (gross margin) from a customer's interaction with the store's limited capacity. Tesco's high profitability in a notoriously low-margin business attests to its successful application of revenue management techniques.[14]

Multiple Service Units

When a single service unit, such as a single flight or one night's hotel stay, is involved, setting differential prices based on expected demand is relatively easy. The price is lower if considerable excess capacity is anticipated and higher if capacity is expected to be more heavily utilized. For many of the business types where revenue management was first used, such as golf courses and restaurants, single service units are the norm. But some business types commonly sell multiple service units in a single transaction. A hotel guest or car rental customer seeks a reservation for several consecutive days; an airline passenger books a round-trip flight, separated in time, with the possibility of multiple flight segments on each of the outbound and return flights. This phenomenon, sometimes referred to as a *network problem*, complicates the pricing. Hotels commonly quote a rate per night; so they can respond by quoting different rates for different nights (e.g., weekdays versus weekends). Car rental companies and airlines typically quote a single price for the package, though increasingly airlines quote the outbound flight separately from the return flight. When modeling is used to quote prices, the models for network situations become complex. Modeling and other decision-making techniques are briefly discussed in Chapter 12.

Beyond the multiple service units (nights) problem faced by hotels is the integration of the varied services that may be provided, such as function space, recreation facilities (such as a golf course), and the like. Hotels must try to balance these various activities in making and pricing commitments. For example, booking function space for a local event may reduce the later prospect of a booking that would combine hotel rooms with function space. Similarly, golf outings might be lost because function space is unavailable, or room bookings by guests seeking golf times may be hindered by booking golf-only customers. A hotel that offers gambling may wish to base its revenue management models primarily on the gambling history of the customer.[15] Integration of all these activities and the establishment of decision rules for advance bookings complicates the revenue management task.[16]

Other Applications

Revenue management is in relatively early stages for many industries. The recent literature has indicated emerging applications in diverse areas such as telecommunications, manufacturing, and hospitals.[17] These applications are likely to continue to expand, because all organizations—even not-for-profits—need to manage their revenues.

Conclusion

Revenue management had its beginnings in a few industries where fixed and perishable capacity and high fixed costs facilitated the development of pricing approaches to fill as much capacity as possible. As these applications have matured, the concept of revenue management spread to other industries with less restrictive characteristics. Revenue management now has applications across a broad spectrum of industries; the literature reflects this increasing diversity of industry applications. Revenue management is well on its way to taking a place beside cost management as an important managerial task.